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**Interest Rate Management in Developing Countries**  
**Theory and Simulation Results for Korea**

Sweder van Wijnbergen

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Sweder van Wijnbergen

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Washington, D.C., U.S.A.

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### Abstract

Much of the existing development literature follows McKinnon and Shaw in claiming that higher time deposit rates raise output and lower inflation in the short run and increase growth via their favourable impact on savings rates. In this paper we show that this result depends crucially on the assumption that the portfolio shift into Time Deposits comes out of an unproductive asset, providing less intermediation than the banking system. We show that if instead TD's are closer substitutes to assets providing more intermediation (such as loans outstanding on the curbmarket) raising TD rates is contractionary. We further look at the impact of changes in TD rates on inflation, capital accumulation and medium term growth. We show that a negative impact on investment and growth and positive effects on inflation in the short run are possible consequences of increased TD rates. The empirical relevance of all this is demonstrated by simulation runs with a quarterly macro-economic model of South Korea.

## Contents

	<u>Page</u>
I. Introduction	3
II. Time Deposit Rates, Bank Lending Rates and Economic Activity: a Simplified Short Run Model.	6
III. Interest Rate Reform, Inflation and Growth.	17
Short Term Effects on Inflation Long Run	17
Effects on Financial Deepening and Growth	23
IV. The Structure of Asset Preferences	31
in Korea: Empirical Evidence	
V. Simulation Exercises	38
VI. Conclusions	48
References	52

INTEREST RATE MANAGEMENT IN DEVELOPING COUNTRIES

Theory and Simulation Results for Korea



## Working Paper

### Section 1

Establishing high time deposit rates <sup>1/</sup> has become a standard part of the policy advice given to LDCs by external experts, ranging from the visiting academic economist via the World Bank to emissaries of the IMF. The rationale behind this advice goes back to an eloquent but occasionally vague analysis presented by R. McKinnon in his well known book on financial intermediation and economic development, McKinnon (5), and a similar book by E. Shaw (8). Their argument rests on the assumption that higher TD rates will increase the savings rate. If one goes on to assume that LDCs are in a neoclassical type situation, where investment equals whatever is left over from total output after consumption has taken its share, the conclusion follows. McKinnon has added an additional argument, which points to the importance of financial intermediation. Higher time deposit rates will, so the story goes, lead to an influx of deposits into commercial banks. This "raises the real size of the banking system and hence the net flow of real bank credit to finance investment," to quote Kapur (4). <sup>2/</sup> This, again, should help long run growth. Kapur does on to argue that the increased availability of funds for working capital purposes will

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<sup>1/</sup> High compared to anticipated inflation.

<sup>2/</sup> Kapur refers in this quote to investment in working capital. Via his assumption of a fixed proportion between fixed and working capital, the statement also applies to fixed capital formation (as is confirmed by his dynamic analysis). Note by the way the stock/flow confusion embedded in his statement.



also increase output and so reduce inflationary pressure given aggregate demand.

It is this body of theory that has led to the almost universal acceptance amongst those concerned with Development Economics of the beneficial effects of increases in TD rates on output and growth. short run consequences are usually not taken into account, nor their possible conflict with the professed long run targets. Local economists in LDCs, who cannot afford to ignore these problems, have mostly resisted the recommended policies. As a result, a McKinnon-style stabilization policy (an increase in time deposit rates coupled with tight money growth rules) has to my knowledge never been implemented. 1/

However, the results obtained by McKinnon/Kapur depend crucially on one hidden assumption on asset market structure, an assumption that is never stated explicitly: all these authors assume that the portfolio shift into TD's is coming out of an "unproductive" asset like gold, cash, commodity stocks, etc.

This seems an overly drastic simplification of the financial structure of most LDCs. Official commercial paper or other primary securities markets are usually in their infancy (with some Latin American exceptions), but in most countries there are flourishing Unorganized Money Markets, UMM, where the public can lend directly to firms or farmers. The existence of such an alternative asset, providing more rather than less intermediation than the banking system, may change the conclusions drastically. It is not at all

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1/ Not even in Korea in 1965, one of the more celebrated monetary reforms. Large capital inflows associated with an opening up of the capital market a few months before the interest rate reform were allowed to feed into the money supply, making for an essentially accommodating monetary policy.

obvious that TDs are closer substitutes to cash, gold, etc., rather than to loans extended on the curb markets. Nevertheless, this assumption is always made in this literature, albeit invariably implicitly. Tobin has been arguing many times more than ten years ago that assumptions like this are of crucial importance in determining the effects of monetary policy.

In the first part of this paper we explicitly formulate the portfolio allocation problem faced by wealthholders in a model that provides a more realistic description of financial markets in LDCs. The public can either hold cash, TDs, or curb market loans. The model is closed by a simple Keynesian fixed price output determination mechanism. We analyze the portfolio shifts that will occur when  $r_{TD}$  changes, and the implications they have for the impact of changes in TD rates on economic activity.

In Section 3 of this working paper we go beyond the Tobin-style analysis and look at the impact of changes in Time Deposit rates on inflation, capital accumulation and medium term growth, integrating the simplified analysis of the first part in a medium term growth model. The model used there stresses not only the portfolio structure analyzed in Part 1, but also the importance of the link between monetary policy and the aggregate supply curve via credit-financing of working capital. Recently, several authors have found that incorporating this institutional detail characteristic of many LDCs has unusual consequences for the link between monetary policy and inflation (Cavallo (3), Bruno (2) or van Wijnbergen (13)).

We will show that taking these institutional characteristics typical for LDCs into account does lead to unorthodox results. A "traditional" analysis of inflation would simply add an expectation augmented Philips curve to the model of Part 1, and come up with the straightforward result that

higher time deposit rates will increase or slowdown inflation depending on whether they have an expansionary effect on economic activity or not. As we will see below, incorporating the influence of real curb market rates on the cost of financing working capital and from there on prices, drastically changes these results. A further victim of our analysis is the optimistic McKinnon view that higher TD rates (whatever their short run impact) will lead to higher growth. If an increase in TD rates raises the real curb market rate, it may slow down the growth rate, the higher savings rate out of income notwithstanding. A condition under which this is bound to happen is derived and analyzed.

To indicate the empirical relevance of these phenomena I have run a few simulations with a model of the Korean economy that incorporates the financial structure outlined before (for a full description of the model see van Wijnbergen (14)). The model is described briefly in Section 4. The simulation results are presented in Section 5. Section 6 concludes.

## Section 2

### TIME DEPOSIT RATES, BANK LENDING RATES AND ECONOMIC ACTIVITY: A SIMPLIFIED SHORT RUN MODEL

In this section we will present a simplified model focusing mainly on asset markets and the substitution effects generated there by changes in interest rates. The real sector is modeled by a simple Keynesian, demand determined, output mechanism. In the next section inflation and LR considerations will be brought in.

The public is assumed to allocate its wealth over currency, time deposits and loans in the curb markets, taking into account the rate of returns on these three assets (minus the inflation rate -  $\hat{p}$ , the real time deposit rate  $r_{TD} - \hat{p}$  and the real curb market rate  $i - \hat{p}$ , real income  $y$  and real wealth  $W$ . 1/2/

The allocation is described by a Tobin-type portfolio model where we impose unit wealth elasticities for simplicity:

$$(a) \quad C^D = f_C(\hat{P}, i, r_{TD}, y)W$$

$$(1) \quad TD = f^{TD}(\hat{P}, i, r_{TD}, y)W$$

$$(c) \quad L_{UMM} = f^{UMM}(\hat{P}, i, r_{TD}, y)W$$

where UMM refers to the curb market (Unorganized Money Market) and with the usual adding up conditions applying to these demand functions:

$$(1a) \quad \sum_i f_j^i = 0, \quad \sum_i f^i = 1$$

A subscript  $j$  indicates a partial derivative with respect to argument  $j$ . Further, we impose the gross-substitute assumption, demand functions have positive derivatives with respect to their own rate of return,

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1/ In this section  $\hat{p}$  is still considered exogenous.  $\hat{p}$  will be "endogenized" in Section 3.

2/ What really matters is the existence of a group of assets more "productive" (i.e., leading to more pass-through into capital) than time deposits, and a less "productive" group. Whether the latter consists of cash, gold or commodity stocks is really not relevant.

but negative with respect to the rate of return on the two alternative assets. Finally, it is a well established empirical fact that currency and time deposits holdings are positively related to income; this implies via the consistency conditions (1a) that the supply of curb market loans depends negatively on income:

$$(1b) \quad f_y^{IMM} < 0$$

By assumption, banks have as their only source of funds private Time Deposits against which they are required to hold reserves at a rate  $\rho$ . They allocate the remainder of their assets over free reserves and loans depending on the inflation rate and the bank lending rate  $r_L$ , so their supply of loans (in real terms) becomes:

$$(2) \quad L_{DMB}^S = b(\hat{P}, r_L)(1 - \rho)TD; \quad 0 < b < 1$$

Finally, firms are supposed to snap up every loan the commercial banks are willing to make, as they are offered at below market interest rates. The remainder of their credit needs is met by the curb market. They need credit to finance working capital (fixed capital is brought in the next section); the need for working capital depends positively on the real product wage and output:

$$(3) \quad D_f = D_f(w, y) \quad D_{f1,2} > 0$$

where  $D_f$  is the business sector's demand for working capital in real terms.

If we put all this in a Tobin-type accounting framework, we get

Chart 1

	DEMAND				SUPPLY
Asset Holders	Public	Banks	Firms		
<hr/>					
Currency	$f^C(\hat{P}, i, r_{TD}, y)W + \rho TD$	$+ (1-b(\hat{P}, r_L))(1-\rho)TD$		=	MR
Time Deposit	$f^{TD}(\hat{P}, i, r_{TD}, y)W$	$- TD^S$		<	0
UMMM	$f^{UMM}(\hat{P}, i, r_{TD}, y)W + b(\hat{P}, r_L)(1-\rho)TD$		$- D_f(w, y)$	=	0

Where MR is the monetary base in real terms and  $TD^S$  the supply of Time Deposits by banks (also in real terms).

Chart 1 incorporates in the TD-row the assumption that Time Deposit rate ceilings throw banks off their supply curve  $TD^S$  and make TD's demand determined. With TD determined by demand, we are left with the market clearing equation for the monetary base MR and for the curb market. Using the various balance sheet constraints with which the public, banks and firms are faced, it is easy to show that equilibrium in the UMM implies equality of demand (by the public and the banking system) and supply of Monetary Base, the two

equilibrium conditions are independent. In what follows we use the UMM equilibrium condition:

$$(4) \quad f^{UMM}(\hat{p}, i, r_{TD}, y)W = D_f(w, y) - L_{DMB}^S$$

substituting (1<sup>b</sup>) and (2) in (4) gives (4a).

$$(4a) \quad f^{UMM}(\hat{p}, i, r_{TD}, y)W = D_f(w, y) - b(\hat{p}, r_L)(1 - \rho)f^{TD}(\hat{p}, i, r_{TD}, y)W$$

The real sector part will be kept as simple as possible, to highlight the portfolio aspects of the issue; a more extended analysis follows in Section 3. All we do now is postulate a simple fixed price Keynesian output mechanism:

$$(5) \quad y = A(i - \hat{p}, y) \quad A_i < 0, \quad 0 < A_y < 1$$

(5) gives the traditional downward sloping IS curve after differentiation: 1/

$$(6) \quad \left. \frac{di}{dy} \right|_{IS} = \frac{(1 - A_y)}{A_i} < 0$$

Differentiation of (4a) gives us the locus describing asset market equilibrium (labeled LM-curve in Figure 1).

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1/ Note that in this section inflation  $\hat{p}$  is still exogenous.  $\hat{p}$  will be "endogenized" in Section 3.

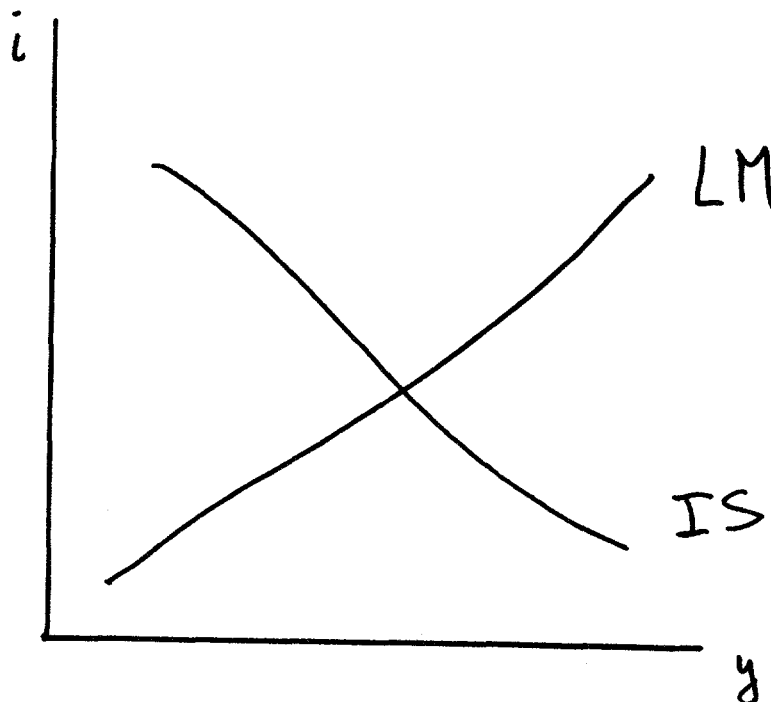


Figure 1

$$(7) \quad \frac{di}{dy} \Big|_{LM} = - \frac{\begin{matrix} (-) & (+) & (-) \\ (f_y^{UMM} + b(1-\rho)f_y^{TD})W - D_{fy} \end{matrix}}{\begin{matrix} (+) & (-) \\ (f_i^{UMM} + b(1-\rho)f_i^{TD})W \end{matrix}}$$

Two of the 3 terms in the numerator are negative, one is positive. But the consistency conditions (1a) allow us to resolve the ambiguity:

$$\begin{aligned} f_y^{UMM} + b(1-\rho)f_y^{TD} &= f_y^{UMM} + f_y^{TD} - (1-b+\rho b)f_y^{TD} \\ &= -f_y^C - (1-b+\rho b)f_y^{TD} < 0 \end{aligned}$$

Therefore  $(f_y^{UMM} + b(1-\rho)f_y^{TD})W - D_{fy} < 0$

holds, so the numerator is always negative.



A similar analysis shows that the denominator is positive:

$$\begin{aligned} f_i^{UMM} + b(1 - \rho)f_i^{TD} &= f_i^{UMM} + f_i^{TD} - (1 - b + \rho b)f_i^{TD} \\ &= -f_i^C - (1 - b + \rho b)f_i^{TD} > 0 \end{aligned}$$

Taking all this together gives

$$(8) \quad \left. \frac{di}{dy} \right|_{LM} > 0 \quad \text{or an upward sloping LM curve.}$$

Let us now analyze what happens when regulated interest rates are changed. First the time deposit rate.

Clearly  $r_{TD}$  has not direct impact on the goods market, so the IS curves does not move. A change (say an increase) does however change the asset portfolio people are willing to hold, as asseholders will move out of currency and curb market loans into time deposits. The impact of this change on asset market equilibrium can be read from equation (4a):

$$\begin{aligned} \left. \frac{di}{dr_{TD}} \right|_{y = \bar{y}} &= - \frac{(f_{r_{TD}}^{UMM} + b(1 - \rho)f_{r_{TD}}^{TD})}{(f_i^{UMM} + b(1 - \rho)f_i^{TD})} \\ &= \frac{(1 - b + \rho b)f_{r_{TD}}^{UMM} - b(1 - \rho)f_{r_{TD}}^C}{f_i^C + (1 - b + \rho b)f_i^{TD}} > 0 \end{aligned}$$

The direction of the shift of LM, and via that the impact of the change of the time deposit rate on economic activity, will depend on the relative sensitivity of the demand for the two alternative assets (currency and curb market loans) to changes in time deposit rates:

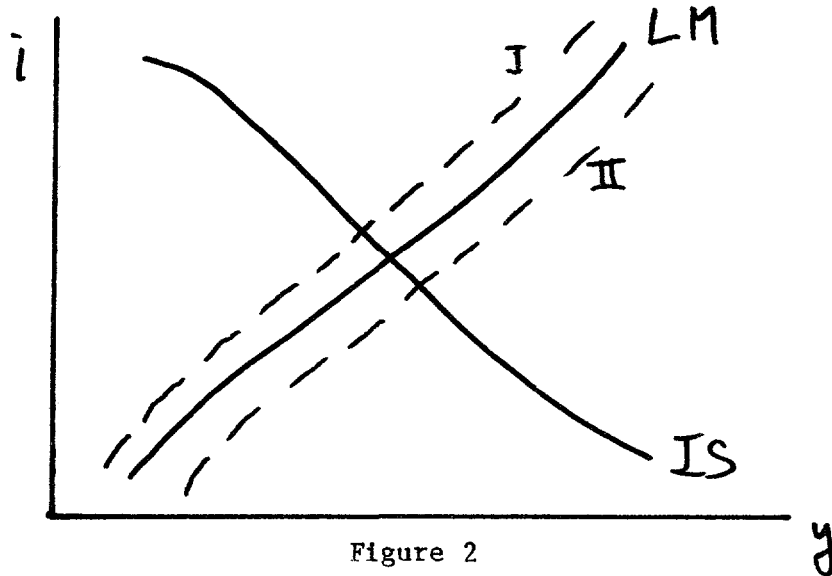


Figure 2

$$(10) \quad \frac{f_{r_{TD}}^{UMM}}{f_C^{r_{TD}}} > \frac{b(1-\rho)}{1-b(1-\rho)} \rightarrow \quad \frac{di}{dr_{TD}} \bigg|_{y=\bar{y}} > 0$$

$$\text{and} \quad \frac{dy}{dr_{TD}} > 0$$

The intuition behind the algebra is quite simple. consider the case that people shift mainly out of curb market loans after a rise in the time deposit rates ( $f_{r_{TD}}^{UMM}/f_{r_{TD}}^C > \frac{b(1-\rho)}{1-b(1-\rho)}$ ). In this case the total supply of funds to the business sector will decline as funds are shifted from the curb market which provides one for one intermediation (no reserve requirements) into the banking system which provides only partial intermediation: partial because a fraction is syphoned off into required and free reserves rather than passed on to

firms. As a result, the curb market rate will increase and economic activity will decrease (case I in figure 1). If the banking system also provides complete intermediation ( $\rho = 0$ ,  $b = 1$  or zero required and free reserves) and the shift comes out of the curb market only ( $f_{r_{TD}}^C = 0$ ), there will of course be no net effect of  $dr_{TD}$  on economic activity as can be read from equation (9).

$$f_{r_{TD}}^C = 0, \rho = 0, b = 1 \rightarrow \frac{di}{dr_{TD}} \bigg|_{y=\bar{y}} = \frac{dy}{dr_{TD}} = 0$$

LM

In the opposite case,  $\rho = 1$ , any shift out of the curb market into time deposits will just lead to reserve accumulation by banks and will therefore be contractionary: 1/

The opposite case (Case II) is the one where people mainly shift out of currency into time deposits, not out of loans extending the curb market:

$$\frac{f_{r_{TD}}^{UMM}}{f_{r_{TD}}^C} < \frac{b(1-\rho)}{1-b(1-\rho)}.$$

Currency is an unproductive asset, so any shift out of it into time deposits, which are partially passed through the business sector by the banking system, leads to greater supply of funds to the business sector, a fall in the curb market rate and an increase in economic activity.

The upshot of all this is that to predict the implication of changes in time deposit rates, one has to have some insight in the financial structure of the economy. Specifically, one wants to know which asset is the closest

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1/ See the following footnote for a qualification.

substitute to time deposits, and whether that asset provides more intermediation than the banking system; also of relevance of course is whether the banking system will be allowed to play its intermediary role or not. The latter case could obtain when for example the banking system is constrained by direct limits on total lending (equivalent to  $\rho = 1$  on the margin in our model). Then an increase in time deposit rates is always contractionary. 1/

Before we incorporate our analysis of this section in the full blown model of Section 3, and look at LR effects, we will look at the effects of a lending rate increase. Under the financial structure found in most LDCs, bank lending rates will not have much impact on demand for credit. Official bank credit is extended at below market rates, which makes non-price rationing of bank credit unavoidable. All a change in the lending rate does in such a case, given the volume of credit extended, is change the "scarcity premium" on the rationed loans received by those privileged firms who managed to have access to bank credit. This is however not the end of the story, the qualification "given the volume of credit extended" is a non-trivial restriction. The reason is that if the banking system is not operating under a system of direct credit limits, an increase in the lending rate will induce banks to hold less free reserves and extend more loans ( $\frac{\partial b(p, r_L)}{\partial r_L} > 0$ ) thus increasing the volume of credit outstanding. This clearly has an expansionary effect, may be a surprising result. Formally, we can see from (4a) that the LM curve shifts to the right while the IS curve stays where it is:

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1/ Unless people shift only out of currency ( $f^{UMM} = 0$ ) in which case  $dr_{TD} > 0$  is neutral when combined with no intermeddiation by banks:

$$f_{r_{TD}}^{UMM} = 0, \rho = 1, b = 0 \Rightarrow \left. \frac{di}{dr_{TD}} \right|_{y=\bar{y}} = \frac{dy}{dr_{TD}} = 0$$

LM

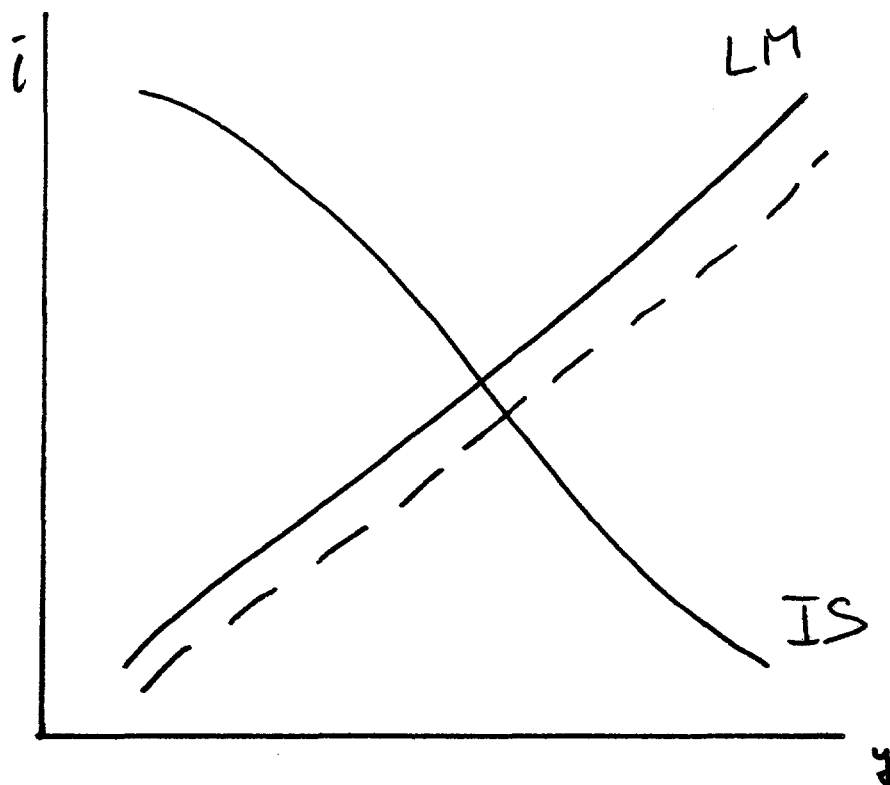


Figure 3

$$(11) \quad \left. \frac{di}{dr_L} \right|_{y=\bar{y}_{LM}} = \frac{(1-\rho)f^{TD} \frac{\partial b(\hat{p}, r_L)}{\partial r_L}}{f_1^C + (1-b+bp)f_1^{TD}} < 0$$

and therefore that

$$(12) \quad \frac{dy}{dr_L} > 0.$$

### Section 3

#### INTEREST RATE REFORM, INFLATION AND GROWTH

In this section we will extend the model in several directions to analyse the effects of an interest rate reform on inflation and medium run growth. Aggregate supply responses and inflation are introduced in the model in Section 3.2. 3.3 puts everything in a medium run growth context by incorporating capital accumulation, monetary dynamics (via the government deficit and the BoP) and relative price movements over time.

#### 3.2 Short term effects on inflation

The key characteristic of the aggregate supply and inflation story presented below is the incorporation of the link between the financial sector and the supply side of the economy via the credit financing of working capital. Cavallo (3) was the first one to point to both the empirical relevance of this transmission channel and the unorthodox result it leads to. Via this channel higher real rates will reduce output; if this effect on aggregate demand, restrictive monetary policy and accompanying high real rates may actually push inflation up in the short run, rather than slow it down. In our model credit is needed to finance labour costs, so that total labour costs will depend on the real wage  $w$ , output  $y$  and the cost of credit,  $i - \hat{p}$  : if we use a Cobb-Douglas production function with share parameter  $\alpha$

$$LC = wY^a K^{-(a-1)} (1 + i - \hat{p})$$

$$a = \frac{1}{1-\alpha} > 1$$

LC labour costs in real terms

Firms determine output such that profits  $pY - LC_p$  will be maximized, which leads to the aggregate supply function <sup>1/</sup>

$$(13) \quad \begin{aligned} 1 &= aY^{a-1} K^{-(a-1)} w(1 + i - \hat{p}) \\ &= ay^{a-1} w(1 + i + \hat{p}) \end{aligned} \quad y = Y/K$$

or output will decline if either the real wage or the real rate go up.

Transformation in "per unit of capital" variables is done in anticipation of the extension into a growth model presented in Section 3.3. The real wage  $w$  is fixed exogenously reflecting the assumption of a Lewis-type surplus labour economy.

Aggregate demand for domestic goods,  $A_d$ , consists of foreign demand (exports  $E$ ), domestic consumption of domestic goods  $C_d$ , investment  $\bar{I}$  and government expenditure (which, for simplicity, is assumed to fall on domestic goods only). World demand for "our" goods depends on the terms of trade  $q = p/(ep^*)$ ; fixed capital formation  $\bar{I}$  depends on the real rate  $i - \hat{p}$  and the profit rate, which in turn depends on  $Y$  and  $K$  given the real wage. We will assume  $\bar{I}$  to be homogenous of degree one in  $Y$  and  $K$  for later convenience.

Finally, the share of consumption that falls on domestic goods depends on the terms of trade  $q$ , while total consumption depends on the real rate (incorporating the McKinnon hypothesis of a positive savings response to

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<sup>1/</sup> Capital letters are used here because the corresponding lower case letters will be used to denote quantities "per unit of capital" in 3.3. So income per unit of capital becomes  $y = YK^{-1}$ .

a higher real rate),  $\frac{1}{p}$  real income corrected for capital losses on nominal assets  $\hat{p}MR$ ,  $y_d = y - \hat{p}MR$  and wealth  $K + MR$  (capital plus the real value of the monetary base  $MR$ ). All this leads to an aggregate demand for domestic goods  $A_d$ :

$$A_d = C_d(q, i-\hat{p}, Y-\hat{p}MR, K + MR) + \bar{I}(i-\hat{p}, Y, K) + \bar{E}(q) + G$$

Finally, we assume the price level to be sticky, relative prices change only gradually. The inflation rate however can change instantaneously in respect to anticipated foreign inflation  $\Pi^*$  or excess demand for domestic goods:

$$(14) \quad \hat{p} = \Pi^* + \lambda(A_d - y)$$

(14) also incorporates the assumption of fixed exchange rates. A micro-economic rationale for equations like (14) is given in Barro (2) and Sheshinsky and Weiss (9). Gradual price adjustment implies the possibility of disequilibrium in the goods market. We ignore the implications this has for the behaviour of the agents in this economy and make the simplifying assumption that unsatisfied demand for domestic goods spills over into the market for foreign goods leaving total expenditure unchanged, and vice versa for the case of excess supply of domestic goods.

---

1/ The question of which real rate (curbmarket or the one on TDs) influences savings propensities cannot be resolved within this model, because the uncertainty that causes the different assets to be imperfect substitutes is not explicitly incorporated here. Choosing the real time deposit rate rather than the real curbmarket rate leaves the results unaffected however.



The financial sector part of the model is left unchanged, with one exception: firms now need to finance not only working capital  $D_f$  but also physical capital  $K$ . So asset market equilibrium is described by an equation that is basically similar to (4a):

$$(15) \quad f^{UMM}(\hat{p}, i, r_{TD}, Y, MR + K) = K + D_f(w, Y, K) - (1 - \rho) f^{TD}(\hat{p}, i, r_{TD}, Y, MR + K)$$

or moving toward "per unit of capita" variables

$$(15a) \quad f^{UMM}(\hat{p}, i, r_{TD}, y, mr+1) = 1 + D_f(w, y, 1) - (1 - \rho) f^{TD}(\hat{p}, i, r_{TD}, y, mr + 1) \quad \underline{1/}$$

We can now analyse the impact of an interest rate reform using equations (13), (14) and (15). Equations (13) and (14) can be combined to get what we labeled the IS curve in Figure 4. This locus describes the interaction between the curb market rate  $i$ , output (per unit of capital now)  $y$  and inflation  $\hat{p}$  via the goods markets: 2/

$$(16) \quad \left. \frac{dp}{dy} \right|_{IS} = - \lambda \frac{(1 - C_{dy} - I_y + (C_{d3} + I_1)(1 + i - \hat{p})(a - 1) y^{-1})}{1 + \lambda mr C_{dy}}$$

The denominator is of course always positive. The numerator however cannot be signed unambiguously. If, in the short turn, supply effects of

---

1 (15) and (15a) also incorporate the simplifying assumption that banks hold no free reserves:  $b \neq b(\hat{p}, i)$  but  $b = 1$  instead, cf equation (4a).

2/ Use (13) to substitute out  $i$  in (14) and (16) comes out.

tight credit policies via the working capital/curb market link (Cavallo-effect) dominate the deflationary impact on aggregate demand of such policies, the numerator is positive and our "IS-curve" slopes downward. This is the case when tight credit policies lead to higher inflation and less output initially, rather than lower inflation and less output as traditionally assumed. The first case commands strong empirical evidence in the only two cases where this Cavallo-effect was investigated at all (Cavallo (3) for Argentina and

van Wijnbergen (14) for South Korea). In what follows we will assume that this "Cavallo-effect" indeed dominates, so that  $\left. \frac{\hat{dp}}{dy} \right|_{IS} < 0$ . By inspecting (13a) and (14a) it can readily be seen that changes in  $r_{TD}$  do not affect the goods market directly, so that IS curves does not shift when  $r_{TD}$  changes.

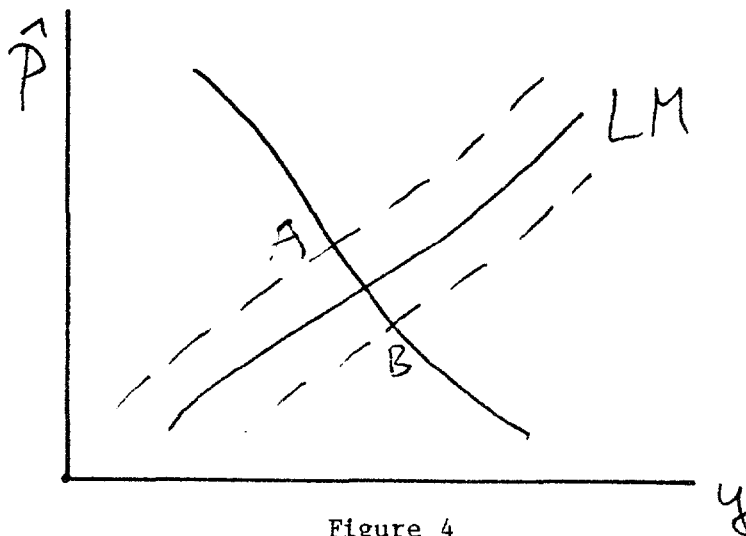


Figure 4

If one uses (13) to substitute out the curb market rate in (15) one gets a locus describing financial markets equilibrium (labeled the LM curve in Figure 4):

$$(17) \quad \left. \frac{\hat{dp}}{dy} \right|_{LM} = - \frac{f_y^C + \rho f_y^{TD} + D_{fy} + (f_i^C + \rho f_i^{TD})(1 + i - \hat{p})(a-1)y^{-1}}{(f_p^C + \rho f_p^{TD} + f_i^C + \rho f_i^{TD})}$$

The LM curve slopes upward: Assume output  $y$  goes up. Higher output  $y$  leads to more demand for loans ( $D_{fy} > 0$ ) but on the other hand it also increases the demand for money and so decreases the supply of loans on the curb market. To get back towards equilibrium, the curb market rate  $i$  has to go up, luring lenders back into the curb market and discouraging demand. However, by assumption  $y$  went up which is only possible in the short run if the real rate falls (equation (13)). Accordingly,  $\hat{p}$  will have to go up even more than the curb market rate leading to a positive slope of the LM curve.

A change in the time deposit rate leads to shift in this LM curve in the same way the LM-curve in Section 2 was affected (Figure 2 and surrounding text, p. 9). If an increase in Time Deposit rates mainly leads to a shift out of the curb market rather than out of cash, the interest rate on the curb market will shoot up because the net supply of funds to firms is reduced (banks soak up part of the influx as required reserves). This in turn will lead to a reduction in output given the inflation rate: the LM curve shifts to the left. In this case an increase in Time Deposit rates is not only contractionary, it will also fuel inflation in the short run. What is going on here the following: if TDs are closer substitutes to curb market loans than to cash, higher TD rates will lead to an increase in the real rate, as well also argued in Section 2. This in turn will reduce supply (because of the higher real cost of credit), and, under our assumption of the predominance of the Cavallo-effect, will do so more than it reduces aggregate demand.

Accordingly, inflation will accelerate in the short run (see point A in Figure 4).

If however higher TD rates result mainly in a shift out of cash (into TDs) rather than out of curb market loans, the net supply of funds to firms will go up because banks will pass at least part of the deposits they receive on to firms, while currency is an "unproductive" asset. This will lead to a lower curb market rate and accordingly to higher output: the LM curve shifts to the right in this case (Figure 4). In the new equilibrium (B, Figure 4) the real rate will have gone down, output will have gone up and inflation will in fact slow down (see point B in Figure 4) because of the reduction of inflationary pressure brought about by the increase in aggregate supply. As we noted in the introduction, this case, where the shift into Time Deposits comes out of an "unproductive" asset, is really the one underlying the McKinnon/Shaw/Kapur analysis.

A final point to note is that in the contractionary case the real rate  $i - \hat{p}$  will go up and output (and profits, given the real wage) down in the short run. Clearly, the growth rate  $I = \frac{\bar{I}}{K} = I(i - \hat{p}, y, 1)$  will fall in that case, which brings us to the subject of the next section, the effects on financial deepening and growth in the medium run.

#### Long run effects on financial deepening and growth

Although the short run problems discussed in the previous sections are of crucial importance for any policy maker considering the implementation of an interest rate reform, the real issue is the medium to long run effect on

financial deepening, savings and growth. It is to that question that we will turn our attention now. In what follows we will discuss these questions using the model set up in Section 3.2 and the associated dynamic equations. The time span considered is called the "medium run" because we do not require net capital accumulation per capita to stop in the steady state; instead, we look at the "medium run" in which capital will be accumulated at a constant (endogenous) growth rate and in which all other real quantities grow at the same rate ("balanced growth"). Similar techniques have been used before by Sargent (7), Pyle and Turnovsky (6) and Taylor (10).

The crucial variables are the terms of trade  $q$ , the growth rate  $I = \frac{\dot{I}}{I}$ , and our indicator of financial deepening,  $mr$ , the real value of the monetary base  $MR$  divided by the physical capital stock  $K$ :  $mr = MR/K$ .

The terms of trade  $q$  will change gradually over time if foreign and domestic inflation rates differ (note our assumption of fixed exchange rates):

$$(18) \quad \frac{\dot{q}}{q} = \hat{p} - \pi^*$$

In the absence of private capital inflows changes in the monetary base  $MR$  originates in the government deficit  $G$  and the current account, minus inflationary erosion  $\hat{p}MR$ .

$$\dot{MR} = G + Y - C_T - \bar{I} - G - \hat{p} MR$$

government deficit	current account surplus (=income minus expend.)	Inflationary erosion
-----------------------	---	-------------------------

Also,  $\dot{mr} = \frac{\dot{MR}}{K} - mr \frac{\dot{K}}{K}$  so that the financial deepening indicator  $mr (=MR/K)$

evolves over time according to (19):

$$\begin{aligned}
 \dot{mr} &= \frac{C}{K} + \frac{Y}{K} - \frac{C_T}{K} - \frac{\bar{I}}{I} - \frac{G}{K} - \hat{p} \frac{MR}{K} mr \frac{\bar{I}}{K} = y - \hat{p} mr - c_T - (1 + mr)I \\
 (19) \quad &= y_D - c_T - (1 + mr)I
 \end{aligned}$$

where  $y_D$  denotes disposable income ( $y_D = y - \hat{p} mr$ ) and lower case letters indicate variables per unit of capital ( $y = y/K$  etc.). Our system is rounded out by the growth rate equation  $\eta = \frac{\dot{K}}{K}$ :

$$\begin{aligned}
 (20) \quad \eta &= \frac{\bar{I} (i - \hat{p}, Y, K)}{K} \\
 &= I(i - \hat{p}, y, 1)
 \end{aligned}$$

The dynamic system is block triangular in  $q$  and  $mr$  versus  $n$ : the evolution of  $q$  and  $mr$  can be determined from (19) and (20), independent from  $n$ .

Before we can analyze (19) and (2) however, we have to express the "short run variables"  $y$ ,  $i$ , and  $\hat{p}$  as functions of the state variables  $q$  and  $mr$  and the policy variable  $r_{TD}$ : <sup>1/</sup>

$$\begin{aligned}
 y &= y(q, mr; r_{TD}) \\
 &\quad - \quad + \quad \pm \\
 (21) \quad \hat{p} &= \hat{p}(q, mr; r_{TD}) \\
 &\quad - \quad \pm \quad \pm \\
 i &= i(q, mr; r_{TD}) \\
 &\quad - \quad - \quad \pm
 \end{aligned}$$

---

<sup>1/</sup> An appendix containing the exact analytical expressions is available on request.

The ambiguity of  $y_{r_{TD}}$ ,  $i_{r_{TD}}$  and  $p_{r_{TD}}$  has been discussed extensively in the previous section. The sign of  $\hat{p}_{mr}$  is uncertain too: the credit/supply-side link via working capital (Cavallo-effect) would tend to slow inflation down immediately after a one shot increase in the Monetary Base (given the capital stock), but wealth effects on spending may reverse this effect. In our diagrammatical exposition we will assume that the first effect dominates so  $\hat{p}_{mr} < 0$ ; it can however be shown that this does not affect any of the results. The signs of the other partial derivatives are fairly self-evident. (21) can be used to link the growth rate to the state variables (substitute (21) in (20):

$$(20a) \quad \eta = \eta(q, mr; r_{TD})$$

- + ±

A loss in competitiveness reduces profitability and therefore investment and medium run growth ( $\frac{\partial \eta}{\partial q} < 0$ ) while the impact effect of higher TD rates on growth and investment is positive or negative depending on what happens to the real rate  $i - \hat{p}$ .

Consider first equation (18):

$$\hat{q} = \hat{p}(q, mr; r_{TD}) - \Pi^*$$

The locus of  $q - mr$  combinations compatible with constant relative prices ( $\hat{q} = 0$ , RP in Figure 5) is downward sloping, given the signs of the partial

derivatives we just discussed.

$$\frac{dq}{dmr} = - \frac{\frac{\partial \hat{p}}{\partial m r}}{\frac{\partial \hat{p}}{\partial q}} < 0$$

An upward shift in  $q$  shifts world demand away from our goods which will slow down inflation in the short run ( $\frac{\partial \hat{p}}{\partial q} < 0$ ); this can be offset by a decrease in the monetary base (per unit of capital), as this causes inflation to flare up again in the short run due to the higher real cost of credit (Cavallo-effect). Accordingly, the RP curve has a negative slope.

In the case where higher TD rates are contractionary, the RP curve would shift upwards in response to a higher TD rate: the higher TD rate would raise the real curb market rate which in turn would push up inflation via Cavallo-effects. This could be offset by an upward shift in  $q$  (a decrease in competitiveness) because that would shift world demand away and so reduce inflationary pressure. So the RP curve shifts up after an increase in TD rates.

The AA locus gives those combinations of  $q$  and  $mr$  that are compatible with constant monetary base/physical capital ratio  $mr$ .

Crucial both for the slope of the curve and for the direction in which it shifts after an increase in  $r_{TD}$  is the question of the impact effect of a real rate increase on financial deepening  $mr$ . An increase in the real rate  $i - \hat{p}$  will slow down investment. The issue is whether it will also slow down financial asset accumulation (which, given the government deficit, can only change via changes in the current account) and if so whether it will do so more than it slows down capital accumulation. On the one hand it will increase financial asset accumulation because a higher real rate leads to a



higher savings rate. On the other hand a higher real rate leads to a lower real income via Cavallo-effects and may so decrease savings the higher savings rate notwithstanding. If the latter effect is strong enough,  $m_r$  could actually decline. Consider first the latter case, with the income effect dominating.

An increase in  $m_r$  will lower the real rate and so increase capital accumulation. It will further decrease private saving both via wealth effects and indirect effects via the real interest rate so on balance financial deepening  $m_r$  will slow down. This can, in the case under consideration, be offset by a decrease in the terms of trade (increase in competitiveness,  $dq < 0$ ): this will lead to more aggregate supply and a lower real rate and therefore to more financial deepening ( $m_r$ ) under the assumption of dominating income effects and so bring us back on the AA-locus. The conclusion is that in this case the AA locus slopes downward (Figure 5) <sup>1/</sup>

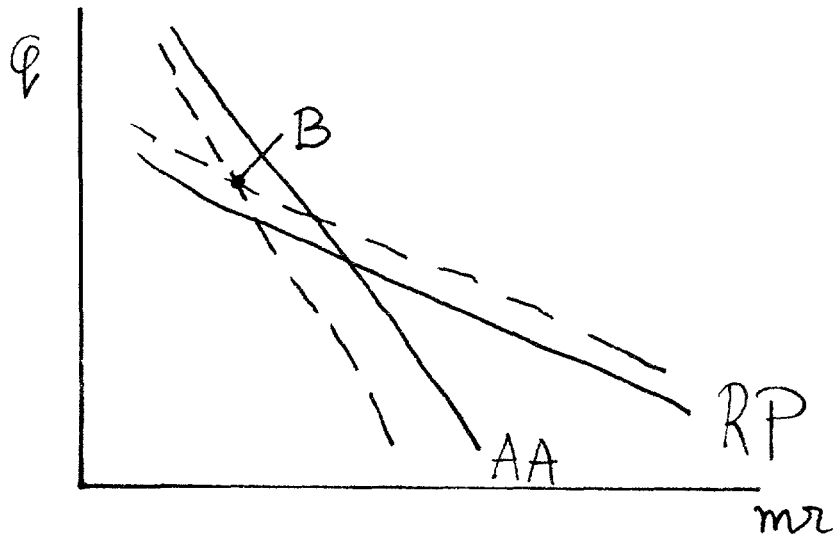


Figure 5

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<sup>1/</sup> Stability requires that the RP-curve cuts the AA curve from below (see Figure 5).

Putting all this together, the long run effects become clear: the initial decrease in financial deepening because of the higher curb market rate persists over time and our indicator of "financial depth"  $m_r$  declines in the new steady state (point B in Figure 5). Also the initial outburst in inflation caused by the higher real rate will lead to a permanent loss in competitiveness ( $q_B < q_A$ ) Figure 5). The effects of the steady state growth rate  $\eta$  and on output per unit of capital are unambiguously negative as medium run profits fall and the real rate rises (cf equation (20a), p. 21 and equation (21)).

Although it is an empirical question whether the negative Cavallo-effects of a higher real rate on output really dominate the positive effects of a higher savings rate in the short run, it is worthwhile to point out that there clearly is a distinct possibility that higher time deposit rates will lead to less rather than more financial depth (a lower  $m_r$ ) and lower growth in the medium run.

Consider finally the case where these negative Cavallo-effects do not dominate so that an increase in the real rate  $i - \hat{p}$  indeed speeds up financial deepening  $m_r$  initially.

An increase in  $m_r$  will still slow down financial deepening, but this should now be offset by an increase in the terms of trade (decline of competitiveness), because a decline would lower the real rate which would slow financial deepening down further when Cavallo-effects do not dominate.

Accordingly, the AA curve now slopes upward (see Figure 6).

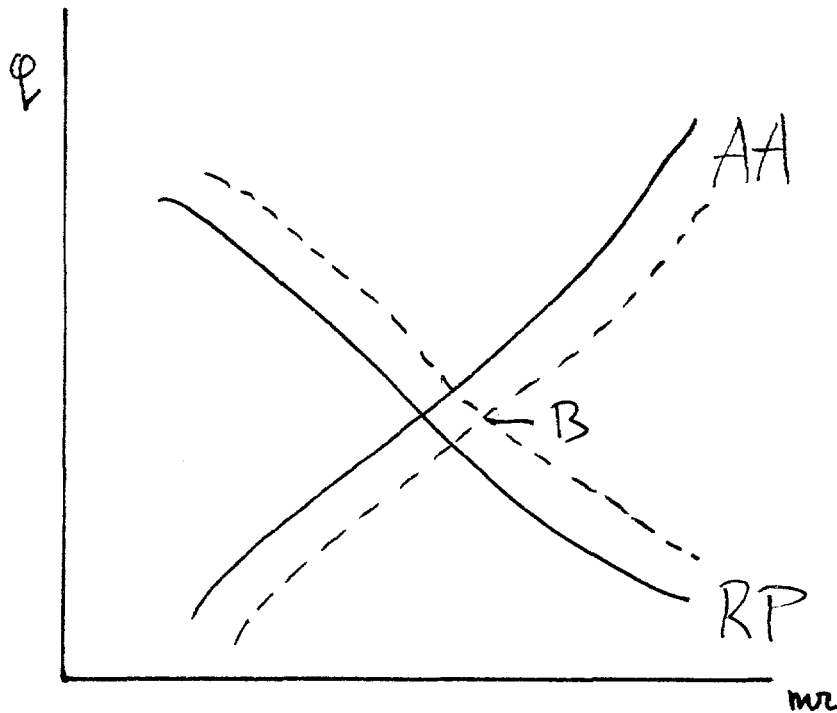


Figure 6

For the same reason the shift after an increase in time deposit rates reverses sign: the higher real rate that results initially now improves financial deepening so that the AA curve shifts to the right (a higher  $mr$  would slow financial deepening down, bringing us back to the AA curve). The long run effects are now more in line with the McKinnon/Shaw analysis (see B in Figure 6). With the savings rate effects dominating the increase in financial deepening sticks and  $mr$  goes up in the long run. The initial outburst of inflation and accompanying decline in competitiveness will be reversed later on under the combined impact of lower world demand and higher domestic savings; whether the initial position will be restored is not obvious however:  $q_C > q_A$  (see Figure 6). Accordingly, the net effect on growth can be either positive or negative: the financial deepening will stimulate

growth, but this may be reversed if competitiveness is not restored sufficiently. So even when the positive effect on the savings rate dominates negative influences on financial deepening, negative consequences for output (per unit of capital) and medium term growth cannot be excluded.

#### 4. The Structure of Asset Preferences in Korea: Empirical Evidence

The Korean financial sector is dominated by the commercial banking system and the curb market, the stock market has continued to play a minor role. This implies that individuals can hold their wealth as currency, demand or time deposits at "Deposit Money Banks" or DMB's (this is the phrase used in Korean statistical publications) or as loans outstanding in the curb or Unofficial Money Market (UMM). The latter option comes down to direct lending to firms, bypassing the banking system.

The UMM is largely an urban phenomenon in Korea. In a survey done by the Sogang university of Seoul, it was found that 79% of UMM lending was to the urban business sector, 7% to urban consumers and the remaining 14% to rural households (the survey was undertaken in 1969). Kim (1976), from whom this information is taken, does not provide information on sample design etc., so one should be careful in interpreting these data. Moreover he reports that urban and rural credit markets are entirely separated. In what follows we will confine our attention to the urban business sector.

In the same survey it was found that 75% of all firms responding had some debts outstanding at the UMM, while 10% had more than 50% of their debts at the UMM. The importance of the UMM has been declining over time however, since the interest rate reform in 1965 improved the functioning of financial intermediaries, and with increasingly easy access to foreign capital

markets. Nevertheless the UMM continues to play an important role. For many small firms the UMM is the only place to go when turned down by commercial banks (which only happens to non-exporters, exporters have automatic access to credit). In the same survey, 93% of the firms with UMM debts gave as the reason for operating in the UMM the unavailability of (sufficient amounts of) bank credit. It seems clear that, from the demand side, the UMM is largely a spillover phenomenon kept alive by the occurrence of credit rationing by commercial banks, which have no control over their lending rates.

So much for the demand for UMM loans, but who supplies them? In the Sogang university survey, 73% of the loans made to the urban business sector came from "relatives and friends and professional money lenders" with the latter taking up 33%. 7.3% came from "men of same trade" and the remaining 19.3% from "miscellaneous", including merchants. So only about 20% represents trade credit. According to Kim (1976), professional money lenders are usually middlemen acting for wealthy businessmen. These results seem to lend support to the approach taken here, where I assume that, in the absence of significant securities markets and an open market in interest bearing government debt, individuals can hold their wealth as currency, demand and time deposits at the banks, or engage in direct lending to the business sector via the UMM. This leads to traditional portfolio allocation equations for the different M2-components, with RUMM, RTD, CPI, income and wealth ( $M2 + LSUMM$ ) as arguments. 1/, 2/ The loan

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1/ RUMM: nominal curb market rate; RTD: nominal time deposit rate; CPI: CPI inflation (= minus the real rate of return on cash balances); LSUMM: volume of loans outstanding at the curb market; GNPKN: nominal GNP.

2/ Simple accounting shows that within the financial structure assumed here,  $M2 + LSUMM$  equals the monetary base plus the value of the capital stock; accordingly this is an appropriate definition of wealth.

supply at the UMM can then be derived via the wealth constraint a private individual faces. The empirical results (based on 2SLS estimates) for the TD demand equation is given in equation 1:

$$(1) \ln\left(\frac{TD}{CPI}\right) = 0.36 - 0.89 \ln\left(1 + \frac{RUMM}{100}\right) + 1.63 \ln\left(1 + \frac{RTD}{100}\right)$$

$$(1.71) \quad (2.42) \quad (4.08)$$

$$(0.91) \quad (0.98) \quad (1.00)$$

$$- 0.38 \ln\left(1 + \frac{\hat{CPI}}{100}\right) + 0.02 \ln\left(\frac{GNPKN}{CPI}\right) + 0.93 \ln\left(\frac{TD(-1)}{CPI(-1)}\right) .$$

$$(3.51) \quad (0.53) \quad (42.4)$$

$$(1.00) \quad (0.40) \quad (1.00)$$

$$R^2 = 0.997 \quad \rho = 0.3 \quad \text{Estimation Period: } 64\text{-I}/79\text{-IV}.$$

Reshuffling the variables to derive dependence on real rates of return of course leaves the coefficients on the two interest rates unchanged, but results in a negative coefficient for the real rate of return on currency (minus the CPI inflation rate): the coefficient on  $\ln\left(1 + \frac{CPI}{100}\right)$  becomes + .36. See Table 1.

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Table 1: Elasticity of Demand for Time Deposits  
with Respect to the Real Rate of Return on:

---

Alternative asset 1 (the curb market);	$\left(\ln\left(1 + \frac{RUMM}{100}\right) - \ln\left(1 + \frac{\hat{CPI}}{100}\right)\right)$	: -0.89
Alternative asset 2 (currency)	$;\left(-\ln\left(1 + \frac{CPI}{100}\right)\right)$	: -0.36
Itself (time deposits)	$;\left(\ln\left(1 + \frac{RTD}{100}\right) - \ln\left(1 + \frac{\hat{CPI}}{100}\right)\right)$	: +1.63

---

Clearly, substitution between the curb market and time deposits is of more

importance than substitution between currency and time deposits. This is of crucial importance for the analysis of the effect of time deposit rate changes on inflation and economic activity. The fact that TD's are closer substitutes to curb market loans than to M1, together with the absence of wealth effects on the demand for time deposits (via which increased savings could have been channeled into TD's over time), is a strong indication that the phenomenal increase in time deposits after the interest rate reform in 1965 was caused by a switch from lending at the UMM to time deposits at DMB's by private asset holders, and not by additional savings as is usually claimed.

The equation for M1 showed no significant wealth or interest rate effects, but a strong dependence on the own rate of return, minus the CPI inflation rate:

$$(2) \quad \ln\left(\frac{M1}{CPIK}\right) = 0.08 - 0.40 \ln\left(1 + \frac{\hat{CPI}}{100}\right) + 0.03 \ln\left(\frac{GNPKN}{CPI}\right) + 0.97 \ln\left(\frac{M1(-1)}{CPI(-1)}\right)$$

(0.81)	(4.50)	(0.50)	(21.6)
(0.58)	(1.00)	(0.38)	(1.00)

$$R^2 = 0.998 \text{ Estimation Period: } 64\text{-I}/79\text{-IV.}$$

Equations (1) and (2) imply a reasonable supply equation for loans on the curb market via the wealth constraint, with positive dependence on its own real rate of return, negative dependence on the real rate of return on the two alternative assets (M1 and Time Deposits) and a unit wealth elasticity.

This portfolio allocation model has been incorporated in a medium sized econometric macro model of the Korean economy. The model structure and the results of the econometric estimation have been presented extensively elsewhere (van Wijnbergen (1982)). Here we will confine ourselves to a verbal presentation of the model structure.

In addition to the private portfolio model a simplified model of the banking system and of some aspects of the corporate sector's financial decisions has been constructed to complete the financial sector. Firms are assumed to have a total loan demand for working capital related to variable costs (wages and intermediate input prices) and aggregate output. They use a Tobin type allocation model to decide on how much to finance from abroad (via private capital inflows from the Eurodollar market) or from the curb market, after they have used up all the bank loans available. These are extended at below market clearing rate but, at least for non-exporting activities, in an aggregate quantity fixed directly or indirectly by the Bank of Korea (BoK). Indirect measures are such things as BoK credit to commercial banks, reserve requirements, etc. The assumption that non-exporters first exhaust available bank credit makes sense given the subsidy element it contains. The case is different for exporters. There were no effective quantity constraints on short term loans (rediscounting facilities) to exporters in the period under consideration, so they have no incentive to enter the curb market. This is also the assumption made in the model.

The model of the aggregate banking sector incorporates a substantial amount of institutional detail. DMB's can be subdivided into domestic commercial banks and branch offices of foreign banks. Although the size of the loan portfolio of foreign banks is relative small, there is an important difference between them and Korean banks that warrants special attention: their liability structure is entirely different, with inter-office loans from abroad making up roughly 60% of their sources of funds (in 1980). Foreign sources provide only 2% of the total of funds available to domestic banks. These inter-office loans sky rocketed after the creation of special swap



arrangements, available to foreign banks only, under which foreign banks sell foreign currency to the BoK under repurchase contracts. In the model presented here we will treat inter-office loans from abroad separately from other foreign borrowing by DMB's.

Inter-office loans to Korean branch offices by their parent banks are determined in the portfolio allocation process of these parent banks. This leads to an equation linking the volume of inter-office loans to the total volume of loans made by foreign (mainly Japanese and U.S.) banks, Korean, Japanese and U.S. interest rates and, in general, the expected rate of devaluation of the Won versus the U.S. dollar and the Yen.

Borrowing abroad by domestic banks depends on domestic lending rates and the costs of obtaining funds abroad: as long as the marginal cost of borrowing abroad is less than the lending rate, the shock of foreign liabilities should be increased. The costs of borrowing abroad depend on the relevant Euro-dollar rate, a country-specific mark-up factor, and the cost of obtaining government guarantees. These latter costs are assumed to be an increasing function of the banks foreign liabilities. Further, there is evidence (Kim (1976)), that the BoK encourages private banks and firms to borrow abroad when the BoK's Net Foreign Assets (NFA) position is considered tight. We tried to capture this by including the number of months of imports that could be financed from the current NFA stock of the BoK as a proxy for this effect. The appropriate scale variable in the equation is the net worth of the DMB's, which we approximate by a time trend.

Other sources of funds are dominated by time and savings deposits and, to a lesser extent, demand deposits. These are covered in the section on

private portfolio allocation. Finally the BoK is an important source of funds (about 10% of total DMB liabilities is with respect to the BoK). BoK to DMB lending is considered a policy instrument.

Then the assets side. Loans extended to non-exporters will depend positively on the lending rate and beginning of period availability of funds from depositors and the BoK. They will further depend negatively on the BoK discount rate and reserve requirements, all standard results. Finally, the loan supply to non-exporters will, in the absence of reserve requirements against foreign liabilities, depend one for one on current foreign liabilities, the other policy instrument in the hands of the DMB's here considered. The final component of domestic credit is credit to exporters. Commercial banks extend loans to exporters at subsidized rates, but can rediscount 80% of them at the BoK, also at subsidized rates. There is no quantity constraint on that rediscounting facility. Accordingly loans to exports are demand determined.

The remaining two items on the asset side are required and free reserves. Required reserves clearly follow from the liability structure. Free reserves then become the residual item, dictated by the behavioral equations specified above and the balance sheet constraint stating that total liabilities are equal to total assets.

The basic structure of the real sector model is as follows. On the supply side, we distinguish between two sectors, exporters and non-exporters. The distinction is made mainly because the government (and the government controlled banking system) follows radically different credit policies with respect to these two groups. Exporters have basically unlimited access to bank credit at subsidized rates, which non-exporters face higher

rates and quantity constraints. The export sector is characterized by monopolistic competition so that firms determine their output and prices simultaneously subject to a downward sloping (foreign) demand curve, input prices and production technology. The domestic sector, which has a much lower degree of concentration as far as firm size is concerned, is assumed to price its products following a simple mark up rule and also faces a downward sloping demand curve (for the market as a whole), describing Korean's allocation of their total expenditure over domestic and foreign goods. The output and pricing decisions are based on a model of the firm that starts from the assumption that primary costs (wages and costs of intermediate imports) are financed via credit. This production model is also behind the intermediate imports demand equation. The wage price sector is completed by an expectation augmented Phillips curve.

##### 5. The Simulation Exercises

To indicate the relevance of the phenomena discussed in the introduction, I have run a number of simulations with the econometric model of the Korean economy discussed in the previous section.

The variables singled out for presentation are first of all the inflation rate and real output; then the current account to see whether expenditure adjustment has also taken place; and finally investment to get some idea of medium term costs.

I am presenting the results of three policy experiments. The first is an increase in the time deposit rate while capital inflows and bank lending are NOT restrained by direct ceilings. The experiment implemented is a 15 percentage point increase over actual levels, in the first quarter of 79 and

sustained until the end of the simulation period, the 4th quarter of 1981.

In looking at the results the reader should keep in mind that a 15 percent increase (nearly a doubling of the rate) is an extremely drastic policy measure.

The second experiment is set up to illustrate that the results are much more contractionary if the banking system is prevented by direct credit limits and capital controls to play its intermediary role. The same change in time deposit rates is "fed" into a version of the model where capital controls and direct credit limits are manipulated to hit the same credit and money targets as were obtained in the absence of the change in the time deposit rate increase.

The third experiment leaves the time deposit rate unchanged but doubles the lending rate (adds 15 percentage points throughout the simulation period).

The results of the first experiment are reported in Figures 1A-4A. As can be read from the econometric results of the estimation of the portfolio model, loans extended on the curb market are a closer substitute to time deposits than cash (and demand deposits); the results conform to our predictions for that case. Inflation shoots up in the quarter where the (near) doubling of the rates hits, with (on an annualized basis) more than 20 percentage points. <sup>1/</sup> This is clearly an impact effect, it dies out after 1 quarter. Curb market rates shoot up and stay high throughout the simulation period, although inflation more or less returns to its base level after one

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<sup>1/</sup> The base level run does not pretend to approximate actual values in 79. We used the version with an endogenous bank loan supply and capital flows, while the Koreans switched to direct credit limits and capital controls in 79-I.

quarter; accordingly real rates increase and output falls.

After an initial deterioration expenditure adjusts more than income, so that the current account improves. Private investment falls initially when the crunch hits, but on balance returns to its old level after the first few quarters: on the one hand real interest rates are up, but so is the increase in real credit extended via the banking system; this happens because the influx of time deposits is partially passed through into capital via bank loans.

R-051(SVD)

# INFLATION(WPK) ANNUALIZED RATE OF CHANGE

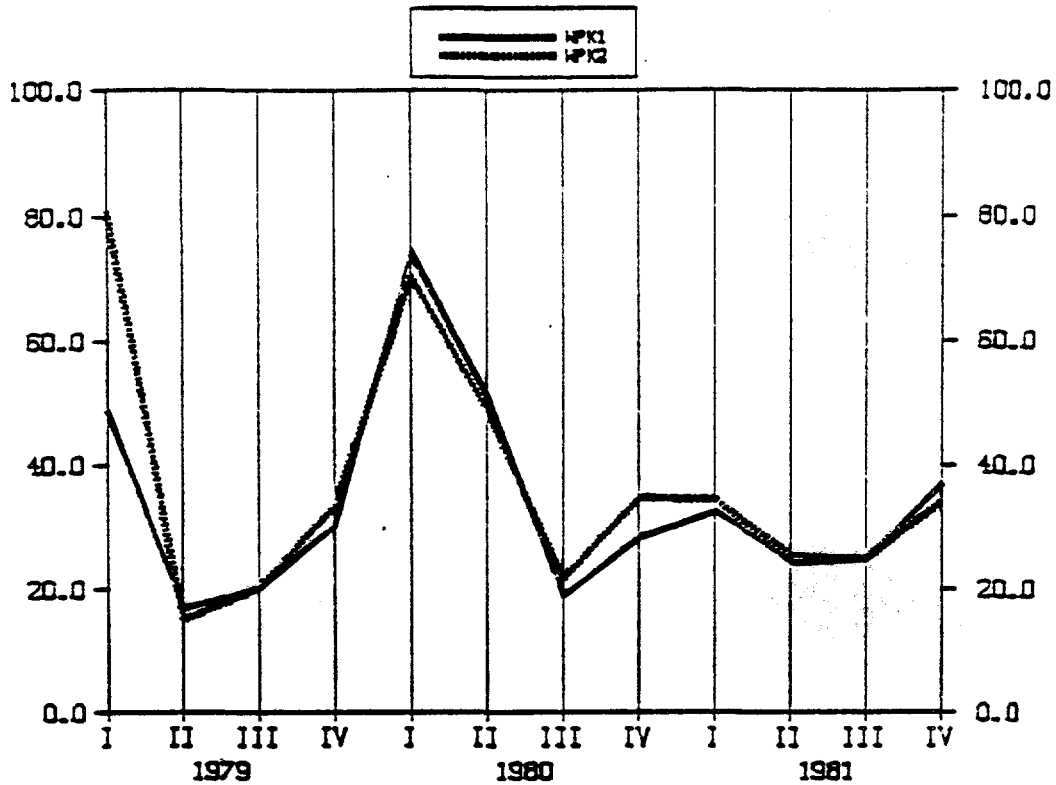


FIG. 1A

# REAL GNP (SEAS. ADJ.)

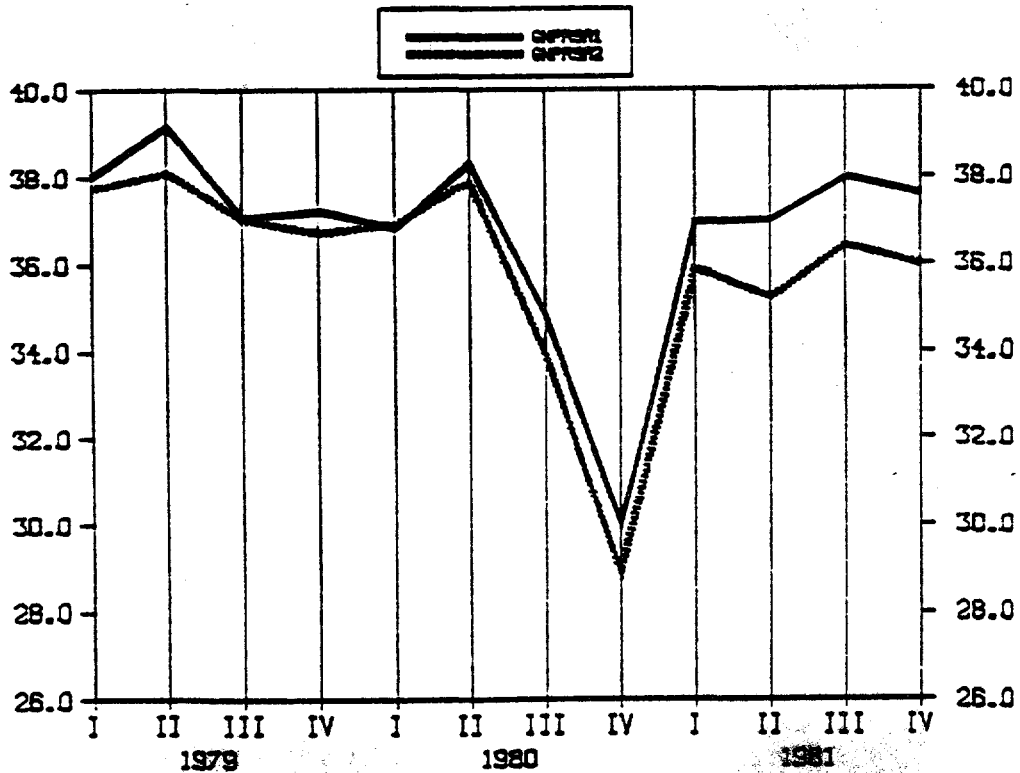


FIG. 2A

## CURRENT ACCOUNT DEF.

(BILLIONS OF US DOLLARS)

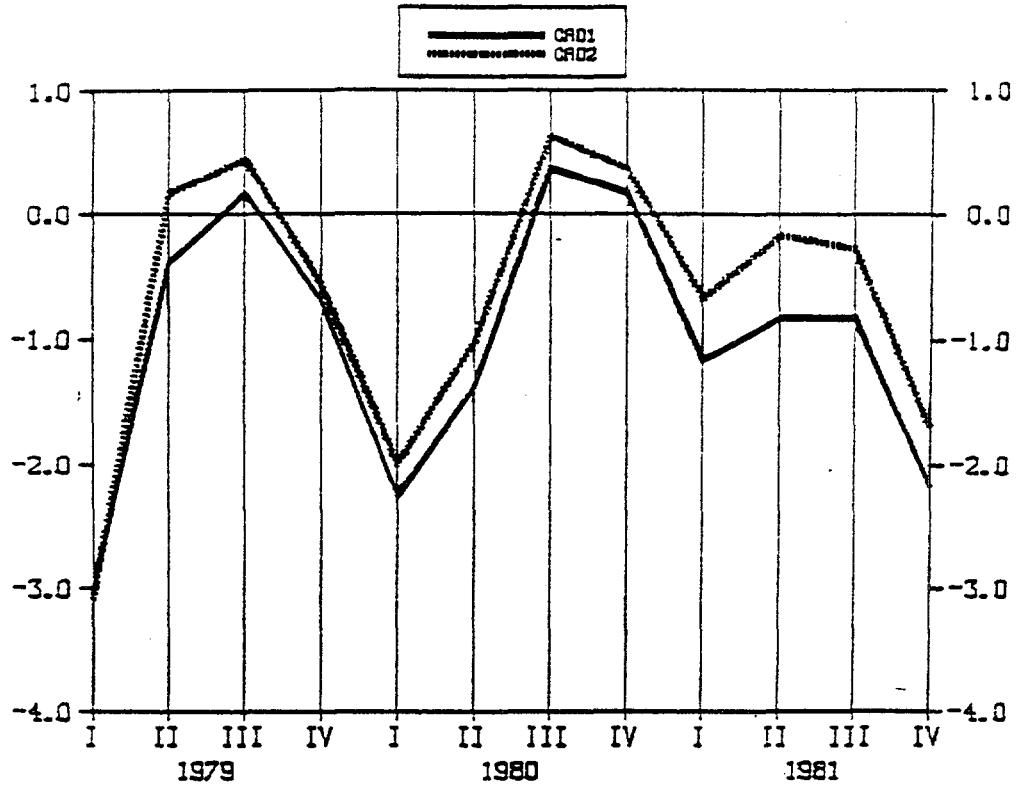


FIG. 3A

## REAL PRIVATE INVESTMENT

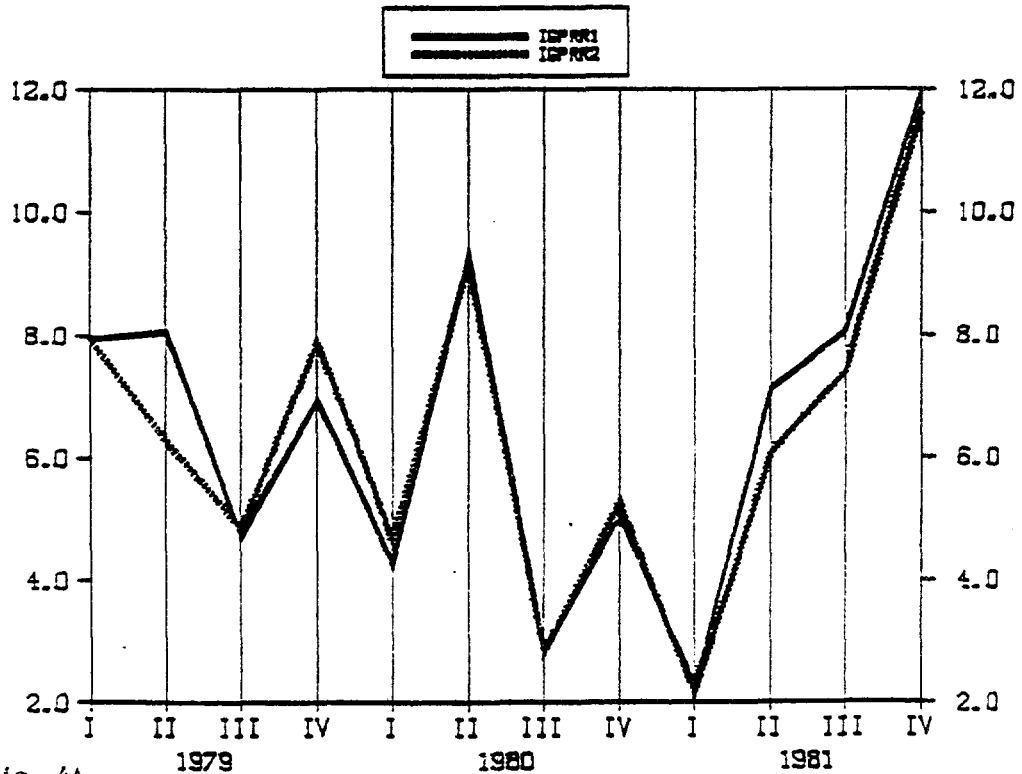


Fig. 4A

In the second experiment this is not allowed to happen, credit limits are imposed throughout the period to keep nominal credit to the private sector at its base level run values. Now the contractionary effects are much more severe: funds are withdrawn from the curb market, and deposited at the commercial banks, but banks are prevented from passing them on to firms by the credit limits. The results for investment are therefore disastrous (Figure 4B).

Real output drops significantly and stays low throughout the period (Figure 2B). The initial impact on inflation is of course a lot bigger (Figure 1B), but once again dies out quickly. Again expenditure adjusts strongly, after a small initial deterioration, the deficit on the current account improves dramatically. The upshot of all this is clear: combining increases in time deposit rates with restrictive monetary policies, at least within the asset market structure prevalent in Korea has stagflationary consequences.

The final experiment feeds a different kinds of shock into the economy, a 15 percentage point increase in the bank lending rate. At the moment of implementation, this amounts to a doubling of the rate, a larger shock than any ever implemented in Korea (although the increased bank lending rate is still nowhere near curb market rates). The results are quite dramatic, partly because of a shift by banks from free reserves towards loans reserves, increase in loans), but much more because of another mechanism, capital inflows via the banking system. The higher lending rates make it much more profitable for foreign banks to lend to their Korean branch offices, and for



## INFLATION(WPK) ANNUALIZED RATE OF CHANGE

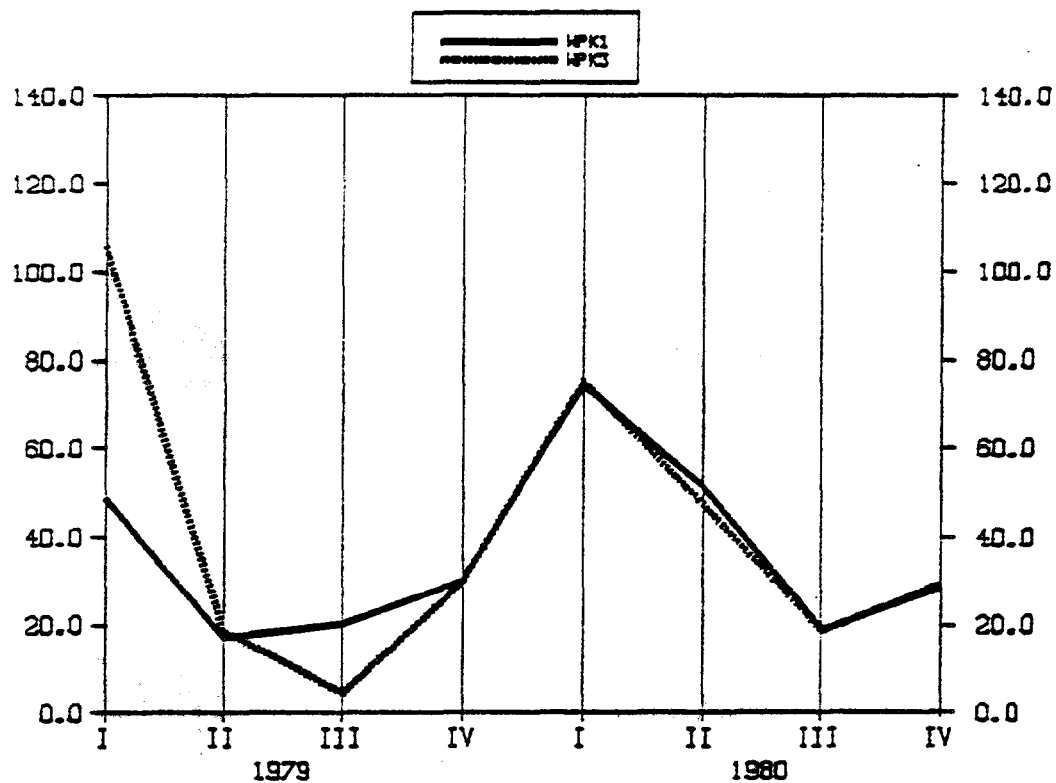


FIG. 18

## REAL GNP (SEAS. ADJ.)

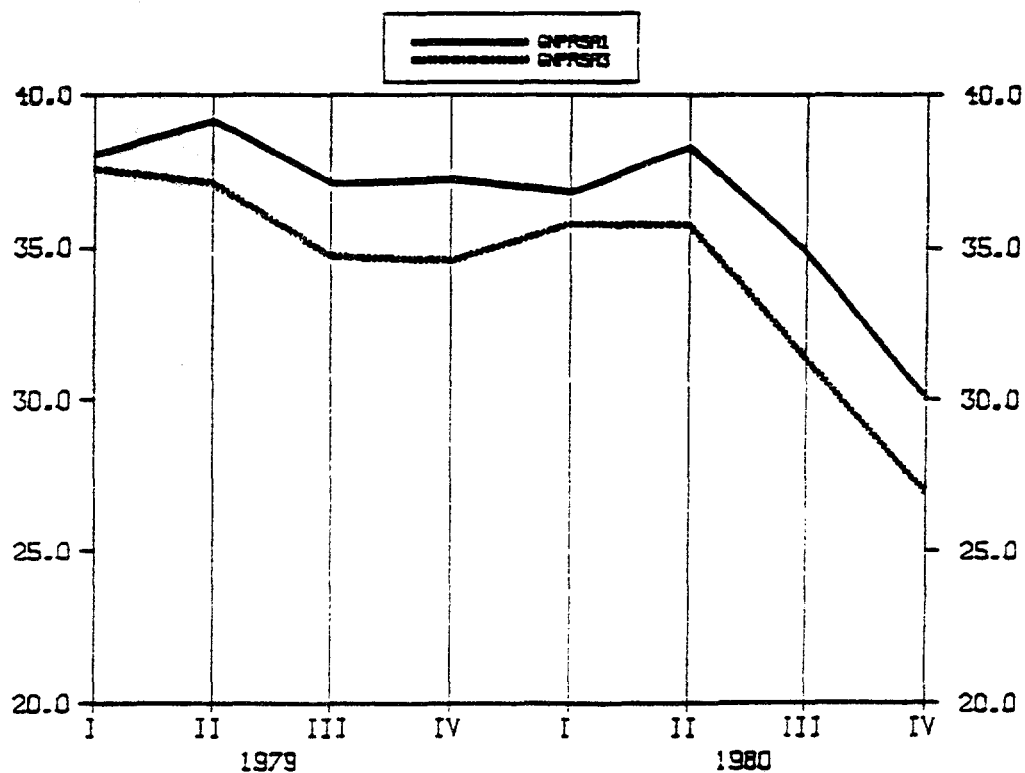


FIG. 28

## CURRENT ACCOUNT DEF.

(BILLIONS OF US DOLLARS)

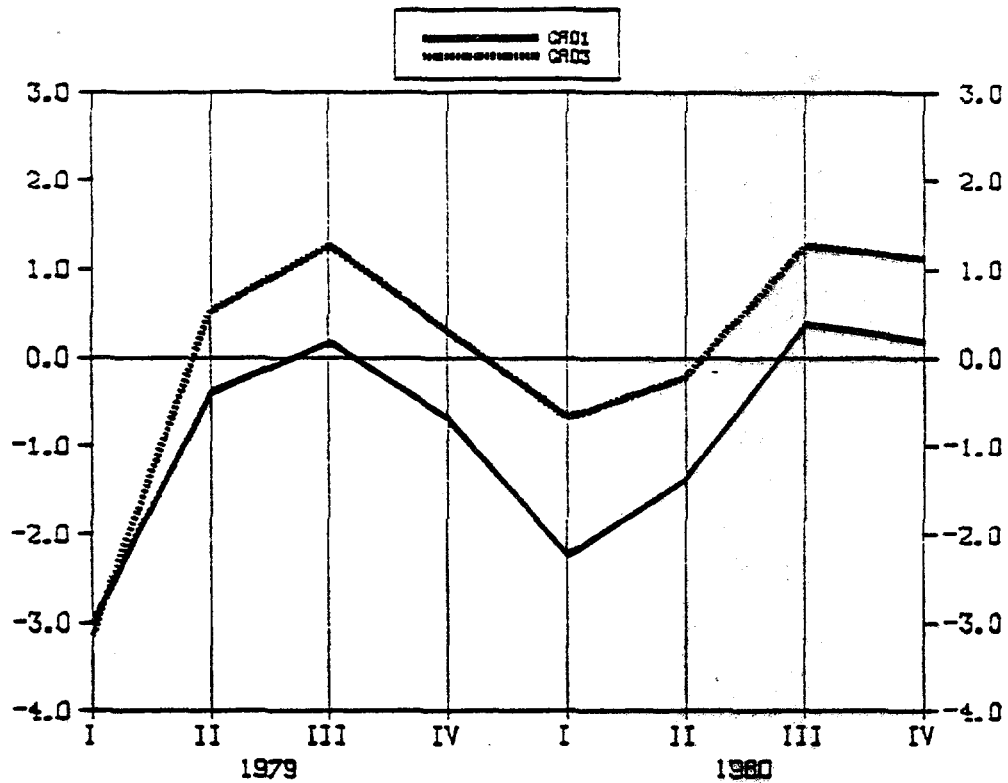


FIG. 3B

## REAL PRIVATE INVESTMENT

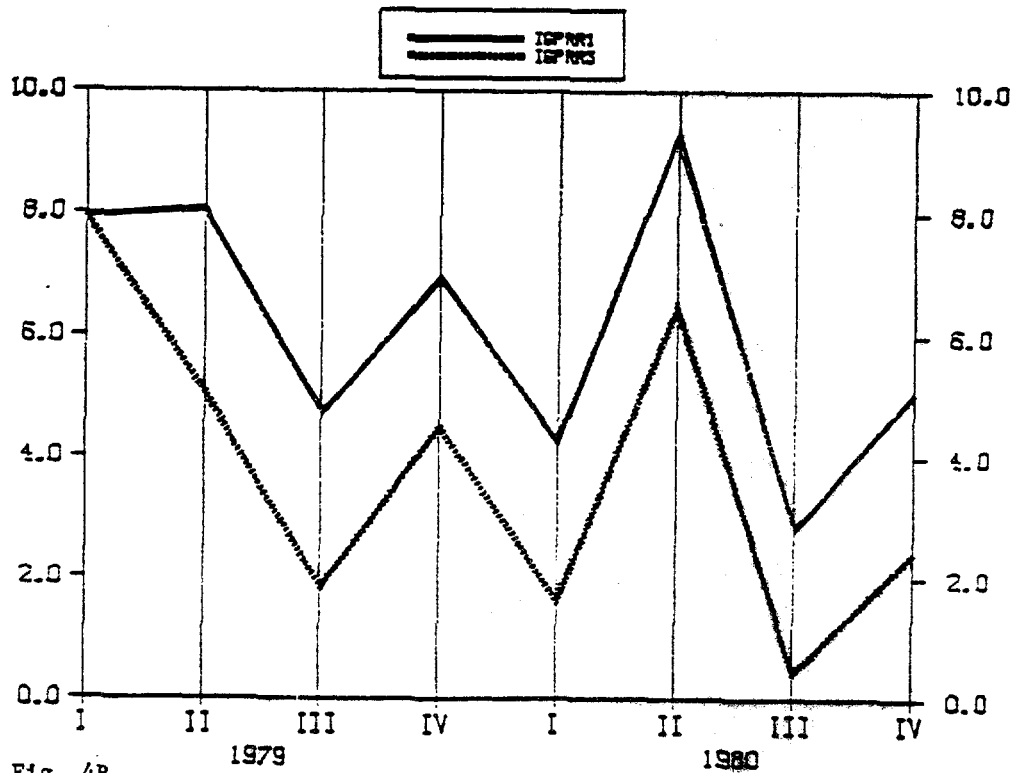


Fig. 4B

## INFLATION(WPK) ANNUALIZED RATE OF CHANGE

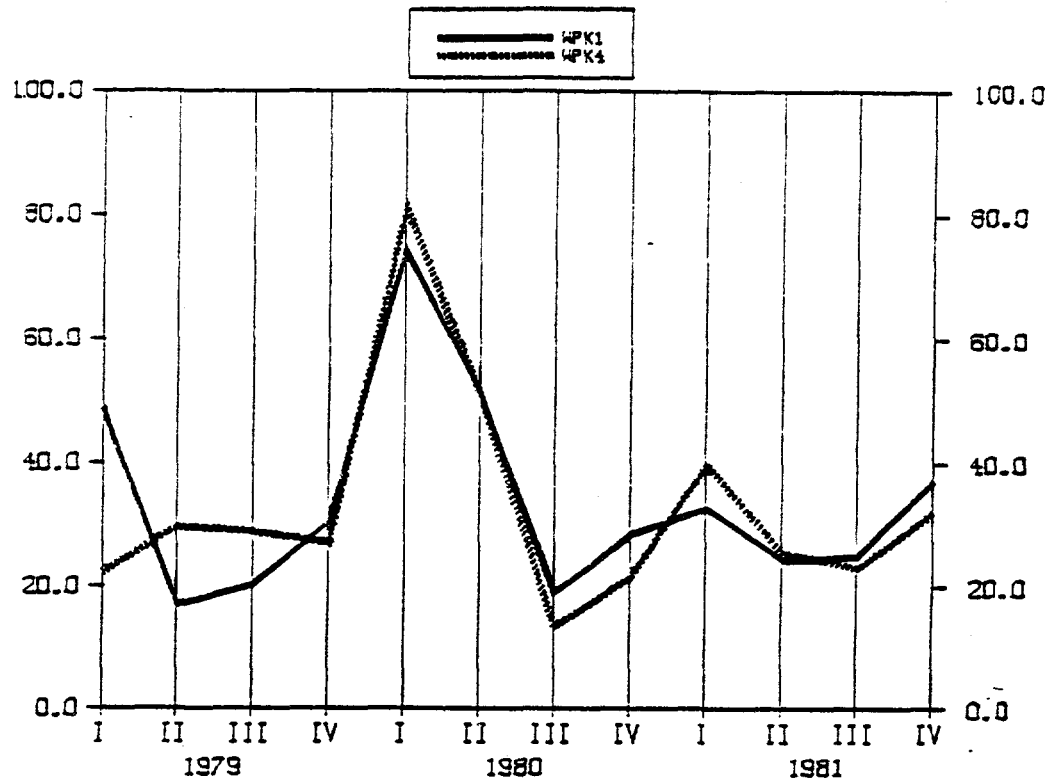


FIG. 1C

## REAL GNP (SEAS. ADJ.)

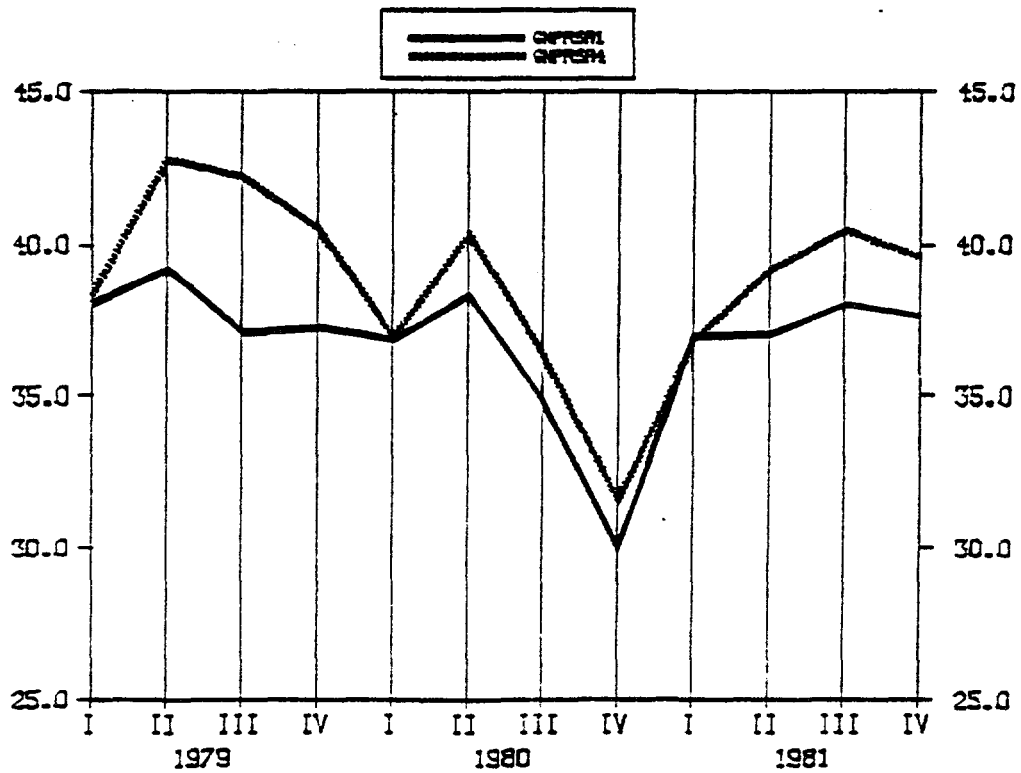


FIG. 2C

## CURRENT ACCOUNT DEF.

(BILLIONS OF US DOLLARS)

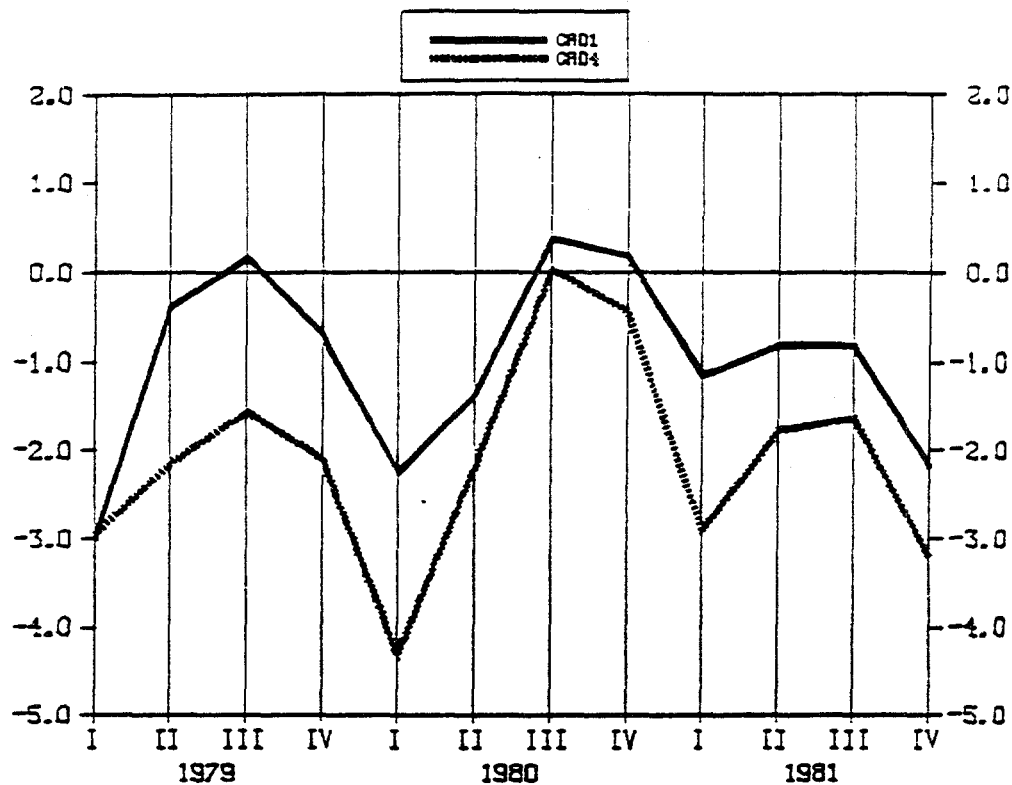


FIG. 3C

## REAL PRIVATE INVESTMENT

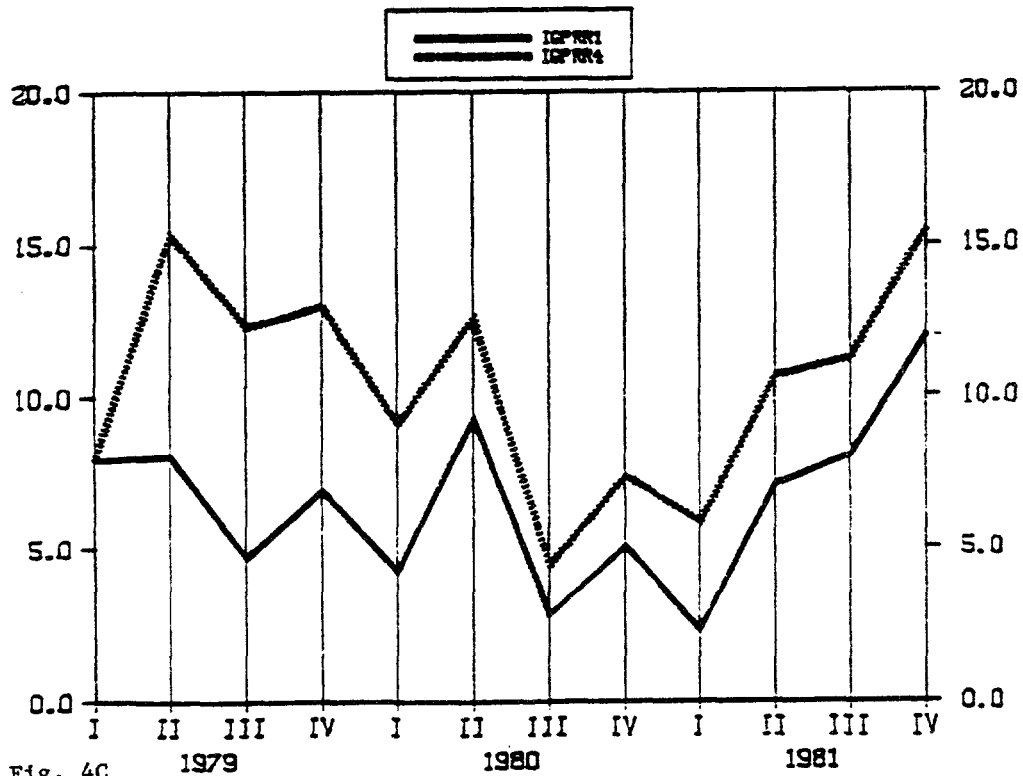


Fig. 4C

Korean banks to borrow at the eurodollar market. In our simulation, inter-office loans from Japanese and American banks more than double after 3 years of higher lending rates (in 81-IV these loans increase 102 percent compared to the base level run), while eurodollar and other foreign liabilities of the domestic commercial banks nearly triple compared with the base level run over the same 3 year period (an 269% increase!). All this is passed through into bank loans one for one, which is the main explanation for the dramatic results. The total supply of loans to the business sector increases substantially, pushing down the curb market interest rate. Investment goes up and stays high under the combined impact of lower curb market rates and increased availability of commercial bank loans. The impact effect on inflation is favourable because of lower real credit costs but dies out quickly; output increases substantially, but so does expenditure leading to a sustained deterioration in the current account (see Figures 1C-4C).

### Conclusions

In this paper we examined the likely impact of changes in bank lending and deposit rates on economic activity, inflation and growth. The results are to be contrasted with the Shaw/McKinnon/Kapur view of the world (at least the LDC part of it); their point of view is, with some exaggeration, that high time deposit rates, preferably positive in real terms, are a good thing to establish in LDC's, a necessary precondition (and sufficient, one is tempted to believe occasionally) for high growth. If short term effects of higher rates are considered at all, they are believed to be favourable, increasing output and reducing inflation.

Our results seriously qualify these claims. Explicit consideration of the portfolio shifts to be expected shows that whether an increase in time deposits is expansionary or contractionary depends on whether Time Deposits are close substitutes to "unproductive" assets providing no pass through into capital, like cash, gold or commodity stocks, or to "productive" assets like loans extended in the curb market. The importance of asset market structure for the effect of monetary policy was stressed a long time ago of course by James Tobin (11).

We then incorporated the Tobin-type analysis in a macro-model incorporating the link between credit and the supply side of the economy via the financing of working capital, a transmission channel shown to be of importance in LDC's, that causes often unexpected responses to monetary policy. The outcome of this analysis is that when time deposits rate increases are contractionary, they will also accelerate inflation; if they are contractionary, they are so because they lead to tight credit conditions as people shift out of the curb market rather than cash. The resulting high real costs of credit lead to an acceleration of inflation in the short run, indicating that in this case increases in time deposit rates will have a stagflationary impact, in sharp contrast to the results obtained by for example Kapur (4). The crucial difference is the implicit assumption made by Kapur, and for that matter by McKinnon (6), that time deposits only substitute with cash or other "unproductive" assets. In that case it is shown that favourable short run effects on output and inflation indeed do obtain.

We then went on to analyse the effects on capital accumulation and medium run growth. In the contractionary case, the initial outburst of inflation after an increase in time deposit rates will lead to a loss of

competitiveness, which, in itself, lowers the profit rate and therefore investment and the medium run growth rate. Financial asset accumulation may slowdown if the fall in income more than offsets the increase in the savings rate; if this happens, the resulting "financial shallowing", to borrow Shaw's phrase, will make slower growth inevitable, as it comes on top of the negative effect of the loss of competitiveness. If however, the savings rate increase dominates, financial deepening will result. The net effect on growth becomes ambiguous in that case: the loss of competitiveness and the "financial deepening" effect work at cross purposes. The important point to note is that we showed there is a distinct possibility that the beneficial effects of a higher savings rate after an increase in time deposits rate, will be thwarted by the contractionary impact of the portfolio reallocation the higher TD rates also cause.

We also looked at the effects of changes in bank lending rates. With bank loans rationed because lending rates are invariably below market clearing levels, there are no negative effects on demand for bank loans to be expected after an increase in lending rates (although some firms may run into cash flow problems). On the other hand banks will be induced to hold less free reserves and borrow more abroad to be able to make more loans when lending rates go up; therefore, the net effect is expansionary, maybe a somewhat surprising result.

Finally, we demonstrated the relevance of these problems with some simulation results obtained from a quarterly econometric model of the Korean economy. Increases in Time Deposit rates were shown to be contractionary in the short run there, because the portfolio shifts they lead to cause a tightening of credit conditions and higher costs of financing working capital:

people shift out of the curb market rather than out of cash. The higher costs of financing working capital also push up inflation in the first quarter after the change, making the increase in TD rates stagflationary. This effect dies out quickly however. The persistence of the loss in output is shown to depend on whether the commercial banks are allowed to play their intermediary role or not: if credit limits prevent passing through into bank loans of the influx of time deposits caused by the higher rates, substantial and persistent real output losses and decreased private investment were shown to result.



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